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COVID-19 vaccine hesitancy, acceptance and informational needs in an Australian cancer population: a cross-sectional survey

Brighid Scanlon[A,B,*] (*MIPH, Nurse Researcher*), David Wyld[A,B,C] (*MBBS, Director of Medical Oncology*), Paul Firman[A,C] (*MPharmPrac, Assistant Director of Pharmacy*), Midori Nakagaki[A,C] (*MSc, Bone Marrow Transplant Pharmacist*), Jo Durham[D] (*PhD, Senior Lecturer*), Glen Kennedy[B,E] (*MBBS, Executive Director*), Paul Moran[E] (*BN, Assistant Director of Nursing*), Michael Smith[B,E] (*MPH, Director of Nursing*) and Nicole Gavin[A,B,C] (*PhD, Nurse Researcher*)

For full list of author affiliations and declarations see end of paper

***Correspondence to:**
Brighid Scanlon
Royal Brisbane and Women's Hospital, Butterfield Street, Herston, Qld 4029, Australia
Email: Brighid.scanlon@health.qld.gov.au

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ABSTRACT

Objective. This study aimed to investigate COVID-19 vaccine hesitancy, acceptance, and unmet informational needs in a cancer population during the first phase of the coronavirus disease 2019 (COVID-19) vaccination rollout in Australia. **Methods.** A cross-sectional survey was conducted in a large tertiary hospital in Queensland, Australia, between 10 May and 31 July 2021. The survey assessed health beliefs, experiences of the COVID-19 pandemic, COVID-19 vaccine hesitancy and informational needs. **Results.** COVID-19 was perceived to be a significant threat to both physical and mental health. While 57.9% ($n = 110$) of respondents believed the COVID-19 vaccines were safe and 64.2% ($n = 122$) believed they were effective, more than half (52.6%; $n = 100$) agreed that they worried about vaccine side effects. Most respondents (84.2%; $n = 160$) planned to receive the COVID-19 vaccine; however, feelings of hesitancy remained. There was a statistically significant association between those aged under 60 years ($P = 0.003$), those with previous vaccine hesitancy ($P = 0.000$), those who felt they had not received adequate information ($P = 0.000$) and vaccine hesitancy. Requested information pertained to interactions with cancer treatments, those with a history of blood clotting and information for those undergoing bone marrow transplantation. **Conclusions.** There is a need for tailored COVID-19 vaccine communication that is responsive to the concerns of people with cancer. This will be beneficial during current and future vaccination rollouts.

Keywords: cancer, communication, COVID-19, oncology, pandemic, vaccination, vaccine hesitancy.

Introduction

Low uptake of vaccinations is a long-standing threat to public health both in Australia and abroad. Past pandemics, such as the 2009 H1N1 pandemic, have highlighted a multiplicity of challenges that affect vaccination rollouts in certain populations.[1] Insufficient vaccination coverage is not only a threat to community health, it also increases the risk for vulnerable populations such as people with cancer.[1] In the contemporary coronavirus disease 2019 (COVID-19) pandemic it has become clear that people with cancer are at a significantly higher risk of morbidity and mortality from COVID-19 than the general population.[2] This is thought to be due to malignancy, oncological treatment, age-related immune dysfunction and other associated comorbidities.[2] Research from the USA has found that patients with recently diagnosed cancer, particularly leukaemia, non-Hodgkin lymphoma and lung cancer are also at increased risk of severe outcomes from COVID-19.[3] Due to this, both the Medical Oncology Group of Australia and the Haematology Society of Australia and New Zealand have advocated for vaccine prioritisation for cancer patients.[4,5] Currently, those who are severely

immunocompromised are often recommended to have additional primary doses of the COVID-19 vaccine.[6,7] Despite this clear need for timely and widespread vaccine coverage, cancer patients have had the challenge of navigating the COVID-19 pandemic and their complex disease, while relying on limited and often generic vaccine information.[8] Those with active malignancies have been underrepresented, and those receiving systemic immunosuppressive therapy have been excluded from COVID-19 clinical trials.[9] However, there is currently no evidence to suggest that cancer populations are at increased risk of vaccine side effects and indeed, research to date offers a consensus that the COVID-19 vaccines available in Australia, namely Comirnaty (Pfizer), Vaxzevria (AstraZeneca), Spikevax (Moderna) and Nuvaxovid (Novavax), are safe and at least partly effective in cancer populations.[10,11]

Vaccine hesitancy is complex and context specific. Factors influencing hesitancy include misinformation, association with adverse health outcomes, unfamiliarity with vaccine-preventable diseases and a lack of trust in corporations, governments and public health agencies.[12] These factors have been exacerbated during the COVID-19 pandemic, which in the digital age has been characterised by widespread misinformation and conspiracy theories.[13–15] Furthermore, the accelerated rate by which the vaccines were produced led to concerns regarding safety in individuals who have historically supported vaccination.[14] The World Health Organization's Strategic Advisory Group of Experts (SAGE) has advocated for a proactive response to vaccine hesitancy by identifying and addressing hotspots.[16] Although there remains a dearth of information regarding COVID-19 vaccine hesitancy in subpopulations, such as people with cancer, estimates from the available literature suggest that prior to the vaccine rollout, between 28% and 36% of the Australian general population were hesitant.[13,14] This is in line with COVID-19 vaccine hesitancy estimates for the USA and UK.[14] Despite these initially comparable levels of vaccine hesitancy, Australia has achieved a significantly higher vaccination uptake than the USA and the UK.[13] This study responds to the need to identify the specific concerns of cancer populations in relation to the COVID-19 vaccines. This will enable health services to tailor information and optimise communication to reduce levels of vaccine hesitancy. Findings from this study may have implications for individuals with other complex, chronic diseases, and assist with preparedness for future pandemics.

Methods

Study design, setting and participants

Between 10 May and 31 July 2021 an anonymous, cross-sectional survey was launched throughout the Cancer Care Services of a large, tertiary hospital in Queensland, Australia. The survey was open to both inpatients and outpatients in the Medical Oncology, Haematology and Radiation specialty services. This included three outpatient treatment units and two inpatient units. The study took place during a turbulent period of the Australian COVID-19 response. The first Australian death linked to thrombosis with thrombocytopenia syndrome and the Vaxzevria (AstraZeneca) vaccine was reported on 16 April 2021, with subsequent cases widely reported throughout May and June.[17,18] On 17 June The Australian Technical Advisory Group on Immunisation (ATAGI) revised its position on COVID-19 vaccines, recommending that those aged 60 years and above receive Vaxzevria (AstraZeneca) and announcing that Comirnaty (Pfizer) was the preferred vaccine for those aged 16 to below 60 years of age.[19] Issues with the vaccination rollout were compounded by media reports throughout June detailing vaccine supply issues in Queensland and throughout Australia.[20] The protracted national rollout and lack of vaccine availability influenced the study site, with on-site vaccination for cancer patients commencing in May 2021, despite this population being recognised as a priority group in March 2021.[4] Queensland underwent lockdowns during June and July 2021, with additional restrictions remaining in place throughout the study period.[21] These lockdowns were intensified by the emergence of the Delta variant of COVID-19 in the Queensland community from 1 July 2021,[22,23] and subsequently led to the significant COVID-19 outbreak and protracted lockdown in New South Wales.[24]

Procedure

This survey was developed and published on the Queensland Health online survey platform *Consultation Hub*.[25] Patients accessed the survey through a quick response (QR) code that was advertised throughout the outpatient areas. Additionally, paper-based surveys were provided to inpatient and outpatient areas. It was made clear that completion of the survey was anonymous, voluntary and would in no way affect the patient's treatment or vaccination.

This survey was adapted from the World Health Organization's *Standard Survey Questions to Assess Vaccine Hesitancy* and reframed in the COVID-19 context.[26] This validated compendium of survey questions was formulated by the SAGE Working Group.[26] The survey assessed five domains, listed below (see Supplementary File S1 for full questionnaire).

1. Baseline demographics: including age, sex, ethnicity, employment, educational level and whether they were attending Medical Oncology, Haematology or Radiation specialty services.
2. Health beliefs: such as 'Do you believe vaccines are important in preventing serious diseases?' (Yes, No, or Somewhat).

3. COVID-19 perspectives: such as 'I am worried about contracting COVID-19' (Strongly agree, Agree, Neutral, Disagree or Strongly disagree).
4. COVID-19 vaccination intent: such as 'Do you plan on receiving the COVID-19 vaccination?' (Yes, No. If no, why?).
5. COVID-19 vaccination perspectives: such as 'I believe the COVID-19 vaccine is safe' (Strongly agree, Agree, Neutral, Disagree or Strongly disagree).

Data management and analysis

Data were analysed using IBM Statistical Package for the Social Sciences version 26.[27] Descriptive statistics were generated for the quantitative data including frequencies, percentages, means and standard deviation. The chi-squared test was used to determine any statistically significant differences between categorical variables. A P-value of <0.05 was considered statistically significant. Free-text responses were analysed by the lead author using a conceptual content analysis of common phrases and responses.

Ethics approval

The study was granted a waiver of ethics approval, given that it was considered a service improvement activity (HREC reference: EX/2021/QRBW/75641).

Results

Sample and response

There were 190 responses: Haematology, 53.1% ($n = 101$); Medical Oncology, 37.4% ($n = 71$); and Radiation, 9.5% ($n = 18$). There was a relatively even proportion of male (55.3%; $n = 105$) and female (44.7%; $n = 85$) respondents. The age range was broadly representative of the Cancer Care Services population, with most respondents aged >50 years (74.2%; $n = 141$). There were no statistically significant differences between the haematology and solid tumour cohorts, therefore the analysis and results presented are from the whole cohort. Full participant demographics are listed in Table 1.

Health beliefs

When asked to rate their overall health, most respondents answered 'good' (45.2%; $n = 86$) or 'fair' (35.8%; $n = 68$), with very few respondents considering their health to be poor (5.8%; $n = 11$) or very poor (2.6%; $n = 5$). Most respondents believed that vaccines are important in preventing serious disease (92.1%; $n = 175$), with a smaller proportion of respondents believing vaccines were somewhat important (6.3%; 12) and very few believing they are not important (1.6%; $n = 3$). Overall, 10.5% ($n = 20$) of respondents reported being reluctant to have a vaccine in the past, with 7.9% ($n = 15$) stating that they had previously declined a vaccine.

COVID-19 perspectives

COVID-19 was perceived as a significant threat to both mental and physical health. When asked if they were worried about contracting COVID-19, 62.2% either agreed (41.1%; $n = 78$) or strongly agreed (21.1%; $n = 40$). Almost 40% ($n = 75$) of respondents reported experiencing anxiety during the COVID-19 pandemic and almost 35% ($n = 66$) of respondents felt that contracting COVID-19 was a high possibility for them. Most respondents (66.3%; $n = 126$) believed that if they contracted COVID-19 they would get very sick.

Factors associated with COVID-19 vaccination intent

When asked if they intended to receive the COVID-19 vaccine, 84.2% ($n = 160$) said yes and 15.8% ($n = 30$) said no. There was an inverse association between age and vaccine intent, with 27.3% of those aged 18–40 years, 24.1% of those aged 41–60 years and 7.1% of those aged ≥61 years answering no ($P = 0.003$). A higher proportion of female than male respondents (21.4% vs 11.3%) also reported 'no' for vaccine intent ($P = 0.058$). Additionally, those with previous vaccine reluctance and refusal were strongly associated with the 'no' response ($P = 0.000$).

Intent to receive the COVID-19 vaccine was higher among those who perceived themselves at high risk of contracting COVID-19 ($P = 0.014$). Similarly, those who perceived that they would get very sick if they contracted COVID-19 were more likely to answer yes ($P = 0.007$). Access to information was strongly associated with vaccine intent, given that those who agreed that they had received adequate information were significantly more likely to answer yes ($P = 0.000$). Perceptions of safety and efficacy were also strongly associated with vaccine intent, with those agreeing that the vaccine is safe ($P = 0.000$) and effective ($P = 0.000$) being more likely to receive it. The extent to which a participant worried about vaccine side effects was associated with their intent to receive it ($P = 0.009$). Oncologist recommendation was shown to be a strong facilitator, with 92.6% ($n = 176$) agreeing that a recommendation from their doctor would positively influence their vaccine decision. There were four key phrases that emerged regarding vaccine intent during the conceptual content analysis, as shown in Table 2. Factors associated with vaccine intent are listed in Table 3.

COVID-19 vaccination perspectives

More than half of the participants felt that the COVID-19 vaccines were safe (57.9%; $n = 110$) and effective (64.2%; $n = 122$), however, there remained some concern regarding the side effects from the vaccines. When asked for their response to the statement 'I worry about the side effects from the COVID-19 vaccines' 52.6% ($n = 100$) agreed or

Table 1. Participant demographics.

Demographic	Haematology (*n*, %)	Solid tumour (Medical Oncology and Radiation) (*n*, %)	Total (*n*, %)	Not answered (*n*, %)
Total	101 (53.2)	89 (49.7)	190 (100)	0 (0)
Age (years)				
18–40	20 (19.8)	12 (13.5)	32 (16.8)	
41–50	10 (9.9)	11 (21.4)	21 (11.1)	
51–60	23 (22.8)	14 (15.7)	37 (19.5)	
≥61	48 (47.5)	52 (58.4)	100 (52.6)	
Total	101 (53.2)	89 (46.8)	190 (100)	0 (0)
Gender				
Male	60 (59.4)	45 (50.6)	105 (55.3)	
Female	41 (40.6)	44 (49.4)	85 (44.7)	
Total	101 (53.2)	89 (46.8)	190 (100)	0 (0)
Religion				
Religious faith	51 (75.0)	42 (72.4)	93 (73.8)	
No religious faith	17 (25.0)	16 (27.6)	33 (26.2)	
Total	68 (35.8)	58 (30.5)	126 (66.3)	64 (33.7)
Marital status				
Partnered	67 (69.8)	56 (65.1)	123 (67.6)	
Not partnered	29 (30.2)	30 (34.8)	59 (32.4)	
Total	96 (50.5)	86 (45.3)	182 (95.7)	8 (4.2)
Employment				
Employed	58 (57.4)	39 (43.9)	97 (51.1)	
Retired	32 (31.7)	30 (33.7)	62 (32.6)	
Student	0 (0.0)	1 (1.1)	1 (0.5)	
Pensioner or unemployed	5 (5.0)	11 (12.4)	16 (8.4)	
Total	101 (53.2)	89 (46.8)	190 (100)	0 (0)
Education level				
Primary school and below	3 (3)	2 (2.3)	5 (2.7)	
High school and below	66 (66)	58 (65.9)	124 (66.0)	
University	31 (31)	28 (31.8)	59 (31.4)	
Total	100 (52.6)	88 (46.3)	188 (98.9)	2 (1.1)

strongly agreed, with a further 33.7% (n = 64) feeling neutral. However, 71.1% (n = 135) agreed that the benefit of the vaccine outweighs the risk of side effects.

Informational needs

Participants were asked whether there was anything in particular about the COVID-19 vaccine that they would like more information on, and a total of 57 participants responded. The most requested cancer-specific information is given in Table 4.

Discussion

This survey investigated COVID-19 vaccine hesitancy, acceptance and informational needs for a cancer population in Queensland, Australia, during the initial phase of the vaccine rollout. The findings from this study indicate that cancer populations are in the difficult position of being both concerned about the effects of COVID-19 on their health and hesitant about receiving the vaccine. This is particularly important becaue it has been shown that people with cancer

Table 2. Key phrases from conceptual content analysis.

Vaccine intent	Key phrases and concepts
Yes (84.2%; *n* = 160)	1. Yes, I intend to receive the vaccine (*n* = 123) 'Already booked in' 2. Yes, when appropriate (*n* = 37) 'Yes, when my health improves' 'Yes, +100 days post bone marrow transplant'
No (15.8%; *n* = 30)	3. Vaccine refusal, safety concerns (*n* = 26) 'Fear of blood clots, after having them in the past' 'Not enough time and research has gone into it for me to feel comfortable' 4. No, considered futile (*n* = 4) 'I'll probably die anyway, so why risk getting blood clots?' 'I have terminal cancer diagnosis. I can't have the vaccine and frankly there is no point'

can experience an inadequate antibody response following COVID-19 vaccination and often require additional primary vaccine doses.[6,28] Therefore, the present findings will be useful beyond the initial COVID-19 vaccine rollout and may assist with future vaccination campaigns.

The findings show that although vaccine refusal rates were low in cancer populations, feelings of hesitancy remain. This was particularly evident in women, those aged 60 years and below, those who have demonstrated previous vaccine reluctance or refusal and those who felt that they lacked adequate information. Further, many respondents were unable to agree that the vaccines were safe (44.2%; $n = 84$) or effective (37.9%; $n = 72$), and more than 50% ($n = 100$) of respondents stated that they worry about vaccination side effects. These feelings of unease appear to be largely offset by the perception that contracting COVID-19 would be a larger threat to health, with more than 70% ($n = 135$) believing that the benefit of vaccines outweighs the risk. This willingness to accept the COVID-19 vaccines, despite feelings of hesitancy, is reassuring for a timely vaccination rollout, however, it highlights an opportunity for health services to tailor vaccine information to reflect the specific concerns of people with cancer.

Respondents identified several areas in which they required additional information. First, respondents identified the need to understand the interaction between COVID-19 vaccines and cancer treatments, such as chemotherapy. Many respondents identified their treatment-induced immunosuppression as a concern. This is consistent with international literature that has highlighted the bidirectional relationship between COVID-19 and cancer.[29] This suggests that those with cancer are at an increased risk of contracting COVID-19, and experience higher morbidity and mortality due to both the disease and treatment-induced immunosuppression.[30–34] Second, several respondents raised concerns regarding blood clotting as a side effect of the COVID-19 vaccines. This is noteworthy because cancer is an independent risk factor for developing venous thromboembolism (VTE), and cancer-associated VTE is a leading cause of death for cancer patients, after mortality from cancer itself.[35,36] Last, patients undergoing bone marrow transplantation (BMT) were identified as a population requiring tailored vaccine information. BMT patients experience additional risks due to their post-transplant immunodeficiency, necessitating a revaccination program for vaccine-preventable diseases.[28,33] Additionally, there were a small number of respondents who identified perceived futility of the vaccine, due to their prognosis. Although this may be appropriate for some patients, it requires in-depth discussions with their treating team regarding the vaccine risks and benefits at the end of life.[37] Therefore, it is imperative that cancer services seek to reassure and support patients through shared decision-making, individually tailored risk assessments and the provision of cancer-specific information.

To reduce hesitancy in this vaccination priority group it is necessary to utilise targeted, effective and transparent communication strategies.[38–42] This encompasses clear and effective communication of current and emerging information from trusted sources, such as oncologists.[40,41] This study has demonstrated the strong influence of medical staff on vaccine decision-making, with 92.6% ($n = 176$) stating that they would receive the vaccine if recommended by their doctor. Recent evidence has suggested that vaccine communication that focuses heavily on efficacy, side effects or vaccine mechanism of action does not affect vaccine beliefs or intentions.[43] Strategies that were influential included targeted messaging to specific groups, working with trusted individuals and training health professionals for face-to-face conversations with vaccine-hesitant individuals.[43] Therefore, in this population there is an opportunity to capitalise on existing relationships of trust between clinicians and patients to address issues of COVID-19 vaccine hesitancy. This will allow for shared decision-making throughout the COVID-19 pandemic and into the future. Optimised communication between patients and their clinicians may also benefit patients with other complex chronic diseases and help them to navigate this, and future pandemics.

Strengths and limitations

Although the study period encompassed many important events in the COVID-19 vaccine rollout, cases of COVID-19 in Queensland were lower than in other Australian states and territories, which may have influenced perceptions of need. It was not possible to capture the response rate for the survey, potentially limiting generalisability. This was a single-site study and therefore may not be representative of the wider Australian or international cancer populations. Strengths of this study include data being collected from a broad range of clinical areas and included multiple disease types.

Table 3. Factors associated with COVID-19 vaccine intent.

Plan to receive COVID-19 vaccine										
Variable		**Yes (*n*)**	**%**	**No (*n*)**	**%**	**Total (*n*)**	**Total (%)**	**X^2**	**d.f.**	***P*-value**
Age (years)	18–40	24	72.7	9	27.3	33	17.4	11.97	2	0.003*
	41–60	44	75.9	14	24.1	58	30.5			
	≥61	92	92.9	7	7.1	99	52.1			
Total		160	84.2	30	15.8	190	100			
Gender	Female	66	78.6	18	21.4	84	44.2	3.60	1	0.058
	Male	94	88.7	12	11.3	106	55.8			
Total		160	84.2	30	15.8	190	100			
Previous vaccine reluctance	Yes	10	50.0	10	50.0	20	10.6	19.34	1	0.000*
	No	148	88.1	20	11.9	168	89.4			
Total		158	84.0	30	16.0	188	98.9			
Previous vaccine refusal	Yes	7	46.7	8	53.3	15	8	16.97	1	0.000*
	No	151	87.3	22	12.7	173	92			
Total		158	84.0	30	16.0	188	98.9			
'I believe contracting COVID-19 is a high possibility for me'	Strongly agree	13	92.9	1	7.1	14	7.5	12.44	4	0.014*
	Agree	47	92.2	4	7.8	51	27.3			
	Neutral	62	86.1	10	13.9	72	38.5			
	Disagree	28	73.7	10	26.3	38	20.3			
	Strongly disagree	7	58.3	5	41.7	12	6.4			
Total		157	84.0	30	16.0	187	98.4			
'I believe if I contracted COVID-19 I would get very sick'	Strongly agree	58	93.5	4	6.5	62	33.2	14.17	4	0.007*
	Agree	47	78.3	13	21.7	60	32.1			
	Neutral	43	86.0	7	14.0	50	26.7			
	Disagree	8	66.7	4	33.3	12	6.4			
	Strongly disagree	1	33.3	2	66.7	3	1.6			
Total		157	84.0	30	16.0	187	98.4			
'I have been given enough information about the COVID-19 vaccine'	Strongly agree	36	97.3	1	2.7	37	19.5	23.65	4	0.000*
	Agree	81	89.0	10	11.0	91	47.9			
	Neutral	29	74.4	10	25.6	39	20.5			
	Disagree	11	73.3	4	26.7	15	7.9			
	Strongly disagree	3	37.5	5	62.5	8	4.2			
Total		160	84.2	30	15.8	190	100			
'I believe the COVID-19 vaccines are safe'	Strongly agree	22	95.7	1	4.3	23	12.4	43.29	4	0.000*
	Agree	84	95.5	4	4.5	88	47.3			
	Neutral	45	73.8	16	26.2	61	32.8			

(*Continued on next page*)

Table 3. (*Continued*)

Plan to receive COVID-19 vaccine Variable		Yes (*n*)	%	No (*n*)	%	Total (*n*)	Total (%)	X^2	d.f.	*P*-value
	Disagree	5	45.5	6	54.5	11	5.9			
	Strongly disagree	0	0	3	100	3	1.6			
Total		156	83.9	30	16.1	186	97.9			
'I believe the COVID-19 vaccines are effective'	Strongly agree	25	92.6	2	7.2	27	14.4	49.44	4	0.000*
	Agree	93	96.9	3	3.1	96	51.1			
	Neutral	37	67.3	18	32.7	55	29.2			
	Disagree	3	42.9	4	57.1	7	3.7			
	Strongly disagree	0	0	3	100	3	1.6			
Total		158	84.0	30	16.0	188	98.9			
'I worry about the side effects from the COVID-19 vaccine'	Strongly agree	21	70.0	9	30.0	30	16.1	13.45	4	0.009*
	Agree	51	78.5	14	21.5	65	34.9			
	Neutral	63	95.5	3	4.5	66	35.5			
	Disagree	19	90.5	2	9.5	21	11.3			
	Strongly disagree	3	75.0	1	25.0	4	2.2			
Total		157	84.4	29	15.6	186	97.9			

*Statistically significant ($P < 0.05$).

Table 4. Informational needs.

	Example
Cancer-specific information	1. During cancer treatments (*n* =8) 'I would like to know its interaction with my cancer treatment' Is it acceptable to have Pfizer while having chemotherapy? 2. Blood clotting history (*n* = 6) 'As a cancer patient with a history of blood clots… what vaccine should I be having?' 'Worried about clotting as just had … tumour removed' 3. Bone marrow transplant (*n* = 5) '…getting vaccinated post bone marrow transplant' '[information] in relation to my graft versus host disease'

The sample was broadly representative of the general oncology population attending this large, tertiary hospital.

Conclusion

The COVID-19 pandemic poses a significant threat to the mental and physical health of people with cancer. As a vaccination priority group, it is imperative that information is communicated in a clear, efficient, ongoing and transparent manner. There is an opportunity for cancer care services to capitalise on established relationships of trust with their populations. This will be beneficial during the current vaccination rollout and as health services navigate this pandemic into the future.

Supplementary material

Supplementary material is available online.

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Author affiliations
[A]Royal Brisbane and Women's Hospital, Butterfield Street, Herston, Qld 4029, Australia.
[B]Queensland University of Technology, 149 Victoria Park Road, Kelvin Grove, Qld 4059, Australia.
[C]University of Queensland, 11 Wyndham Street, Herston, Qld 4006, Australia.
[D]School of Public Health, Queensland University of Technology, 149 Victoria Park Road, Kelvin Grove, Qld 4059, Australia.
[E]Cancer Care Services, Royal Brisbane and Women's Hospital, Butterfield Street, Herston, Qld 4029, Australia.